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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
NELSON, MICHAEL E	

ART UNIT	PAPER NUMBER
4174	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/506,914	MAXTED ET AL.	
	Examiner	Art Unit	
	Michael E. Nelson	4174	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8,11,13,14,16-24,26-32 and 34-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,11,13,14,16-24,26-32 and 34-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 September 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *09/03/2004,10/04/2004,11/05/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

2. On page 9, the end of the first paragraph, the last word is cut off after the first letter. From the rest of the sentence, it appears that the word should be **unit.**

3. On page 17, the title of the second paragraph, Bis[3,6(3-**formyllphenyl**)-carbazol-9-yl]biphenyl should be corrected to Bis[3,6(3-**formylphenyl**)-carbazol-9-yl]biphenyl.

4. On page 18, the title of the second paragraph, Bis[3,6(3-vinylphenyl)-carbazol-9-yl]**bipheny)** should be corrected to Bis[3,6(3-vinylphenyl)-carbazol-9-yl]**biphenyl**.

Appropriate correction is required.

Claim Objections

5. Claims 24, 26 and 38-39 are objected to under 37 CFR 1.75(c), as lacking antecedent basis in the parent claim. Applicant is required to amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

6. Claims 24 and 26, depend from claim 23, while claims 38-39 depend from claim 37. Claims 23 and 37 include an electrode and counter electrode. Claims 24 and 38 recite "**the anode,**" while claim 26 and 39 recite "**the cathode.**" While it is well known in the art that one electrode is an anode and one electrode is a cathode, the claims as written do not acknowledge that fact.

7. Examiner recommends including a statement in claim 24 such as:

8. "where one of said electrode or counter electrode is an anode, and additionally comprising a hole-transport layer, etc., OR

9. "a hole-transport layer located between one of said electrode or counter electrode and the light emitting layer."

10. Similar corrections are required for claims 26, 38 and 39 to correct the lack of antecedent basis in the parent claim.

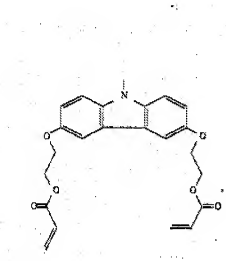
Claim Rejections - 35 USC § 103

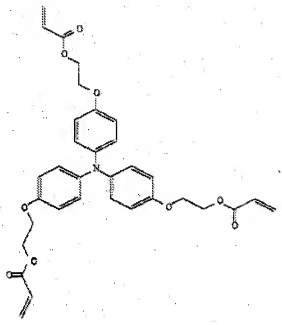
11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

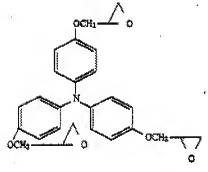
> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 1-5, 11,13-14, 16-21, 23-24, 26, 28-29, 34-35, and 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Funhoff et al. (5,518,824) in view of Lamansky et al. (Organic Electronics, vol. 2, no. 1, pp. 53-62, 2001).

13. Concerning claim 1, Funhoff et al. describe compositions comprising a polymerisable compound which undergoes polymerization on exposure to heat or actinic radiation such as the compounds shown below: (columns 7-9)







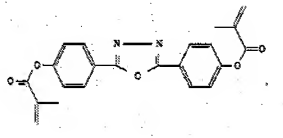
and further include other compounds that transport charge in any manner, expressly including those, which are components of the emitter layer, including photoluminescent materials, such as fluorescent dyes. (column 3, line 20-Column 4, line 2)

14. Concerning claims 3-4, Funhoff et al. describes the substituents on the charge transporting compounds, including ethylenically unsaturated groups such as acrylates, methacrylates, or maleic acid derivatives (column 5, lines47-48), vinyl ethers (column 5,

line 52), or styrenes (column 6, line 43); or cyclic ether moieties such as epoxides. (column 5, line 52)

15. Concerning claim 5, Funhoff et al. describe the charge transporting core structure of the polymerizable composition, including carbazoles or arylamines, as shown above.

16. Concerning claim 11, Funhoff et al. also disclose electron transporting materials as part of the polymerizable compositions, such as the oxadiazole shown below: (column 8)



17. Concerning claim 17-18, Funhoff et al. disclose that the composition may be dissolved **with or without** a cationic or free radical initiator. (column 11, lines 9-10)

18. Concerning claim 19-20, Funhoff et al. disclose that the compositions are formed into layers (solid films) in an electroluminescent device, and crosslinked **thermally** or with **actinic radiation**. (Column 2, lines 53-55, lines 65-67, column 11, lines 15-16).

19. Concerning claim 21 and 35, Funhoff et al. disclose that the compositions are applied by means of spin coating, dried, and then crosslinked (thermally or by actinic radiation), and can be structured by imagewise exposure (in a predetermined pattern), followed by washing out of unexposed parts. (column 3, lines 8-10).

20. Concerning claims 23-24, 26, and 37-39, Funhoff et al. describe an electroluminescent device comprising a substrate **(1)**, base electrode (anode) **(2)**, hole

transport layer **(4)**, emitter layer (light emitting layer) **(5)**, electron-transporting layer **(6)**, and top electrode (cathode) **(8)**. (Figure)

21. Concerning claims 28-29, Funhoff et al. describe the method for forming the film, where the composition is coated on a substrate to form a film, then crosslinking (polymerizing) the composition by means of actinic radiation or by heating (column 11, lines 8-16). Funhoff et al. further disclose that where the film is crosslinked by radiation, the layers can be directly structured, by imagewise exposure (through a mask), and unexposed parts can be removed by washing. (column 3, lines 7-12)

22. Funhoff et al. are silent on the use of a phosphorescent material as the dopant material in the composition (claim 1), where the triplet energy of the charge transporting fragment is equal to or slightly greater than the energy of the phosphorescent material (claim 2), the nature of the phosphorescent material (claims 13-14), or the percentage of the phosphorescent material in the composition (claims 16 and 34).

23. Concerning claim 1, 13-14, Lamansky et al. describe organic electroluminescent devices comprising polymer charge transport materials doped with phosphorescent dopants, where the polymer is composed of a carbazole moiety (polyvinyl carbazole), the phosphorescent materials are organometallic complexes of transition metals, specifically Pt and Ir. (Fig. 1) Lamansky et al. report that efficiency of the devices is expected to improve by the use of phosphorescent materials, compared with fluorescent materials due to the fact that phosphorescent materials can utilize both singlet and triplet excited state energy.

24. Concerning claim 2, Lamansky et al. describe several devices with different phosphorescent dopants, with different electroluminescence frequencies (Fig. 4), and discussed the mechanisms for exciton formation, and state that the electroluminescence results, at least partially, from triplet-triplet energy transfer from the host, indicating that the triplet energy of the host material is higher than the dopant material (section 3.4).

25. Concerning claims 16 and 34, Lamansky et al. further disclose a range of doping concentrations for the devices where the phosphorescent material is between 0.6 and 4 wt. % (table 2).

26. Since it is known in the art to dope polymer materials (particularly those with charge transport functions such as carbazoles) with phosphorescent materials to produce electroluminescent devices, it would have been obvious to one of ordinary skill in the art to use phosphorescent materials as the dopant material in the electroluminescent devices described by Funhoff et al. since the devices would be predicted to function, with an improvement in efficiency based on the use of phosphorescent materials compared with fluorescent materials.

27. Claims 27 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Funhoff et al. (5,518,824) and Lamansky et al. (Organic Electronics, vol. 2, no. 1, pp. 53-62, 2001) as applied to claims 1-5, 11,13-14, 16-24, 26, 34-39 above, and further in view of Migliorato et al. (4,834,505).

28. Concerning claims 27 and 40, Funhoff et al. describe electroluminescent devices where the polymer layers are crosslinked by thermal or actinic radiation, as discussed above. Funhoff et al. further disclose that the electroluminescent device is useful for the production of displays (abstract). Funhoff et al. are silent on the use of active matrix addressing in the electroluminescent device, but does disclose the electrical contacts (9) on the electroluminescent device. (Figure)

29. Migliorato et al. describe circuitry useful for liquid crystal displays and electroluminescent cells (column 9, lines 23-29). Migliorato et al. further describe that active matrix addressing is known in the art, to identify uniquely the cell to be switched at any one time and prevent partial switching of other cells. (column 1, lines 16-26).

30. It would have been obvious to one of ordinary skill in the art to use active matrix addressing for the electroluminescent devices described by Funhoff et al. for the purpose of incorporating the electroluminescent device into a display device.

31. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Funhoff et al. (5,518,824) and Lamansky et al. (Organic Electronics, vol. 2, no. 1, pp. 53-62, 2001) in view of Okunaka et al. (6,696,181).

32. Concerning claim 30, Funhoff et al. describe an electroluminescent device formed from solid films of a composition of polymerizable material with a dopant, while Lamansky et al. disclose the use of phosphorescent dopants in polymer based electroluminescent devices as discussed above. Funhoff et al. further describe the method of forming the film whereby the composition is treated with heat or actinic

radiation to induce polymerization (crosslinking), as discussed above. Funhoff et al. further disclose that where the film is crosslinked by radiation, the layers can be directly structured, by imagewise exposure, and unexposed parts can be removed by washing. (column 3, lines 7-12) Funhoff et al. are silent on an explicit description of the method for forming the layers of the device, where the film is exposed to actinic radiation through a mask and then developed to remove unexposed material.

33. Okunaka et al. describe a method for forming an organic electroluminescent device where a polymerizable composition containing a dopant is deposited on a substrate (column 25, lines 26-36), and then film is crosslinked by exposure to ultraviolet radiation via a photomask. (column 26, lines 25-26) The unexposed area was developed by immersion in N-methylpyrrolidone, followed by rinsing with acetone to remove unexposed material. (column 26, lines 36-39).

34. Given the general teaching by Funhoff et al. that the film can be structured by imagewise exposure, and the specific teaching by Okunaka et al. where the film is exposed to actinic radiation through a photomask, followed by treatment with solvent to remove unexposed material. It would have been obvious to one of ordinary skill in the art to use the specific method described by Okunaka et al. on the device described by Funhoff et al., since the method would be predicted to work in the same manner.

35. Claims 22 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Funhoff et al. (5,518,824) and Lamansky et al. (Organic Electronics, vol. 2, no. 1, pp. 53-62, 2001) as applied to claims 1-5, 11,13-14, 16-24, 26, 28-30, 34-39 above, and

further in view of D'Andrade et al. (Advanced Materials, vol. 14, no. 2, pp.147-151, Jan. 2002).

36. Concerning claims 22, and 36, Funhoff et al. describe the formation of thin films and electroluminescent devices formed by crosslinking by thermal or actinic radiation treatment, as discussed above. Funhoff et al. disclose devices with several layers, which are formed on top of each other, where each layer is treated individually prior to the disposal of the next layer, though the multiple layers do not all include a luminescent material. Funhoff et al. are silent on a device that has at least two solid films that both comprise the polymerizable composition, including the phosphorescent material, or a method of forming a multi-color light-emitting layer.

37. D'Andrade et al. describe multi-color electroluminescent devices, comprising multiple layers, each doped with a phosphorescent material. Each layer emits a different color (Yellow, Red, or Blue, Table 1). The combination of the layers produces white light. D'Andrade et al. disclose that such devices are of interest as alternatives for backlights in flat-panel displays or for use in lighting.

38. It would have been obvious to one of ordinary skill in the art to use the multi-layer light-emitting layer described by D'Andrade et al. in an electroluminescent device described by Funhoff et al. and Lamansky et al. for the purpose of producing a white emitting electroluminescent device.

39. Claims 31-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Funhoff et al. (5,518,824) and Lamansky et al. (Organic Electronics, vol. 2, no. 1, pp.

53-62, 2001) and D'Andrade et al. (Advanced Materials, vol. 14, no. 2, pp.147-151, Jan. 2002) in view of Okunaka et al. (6,696,181).

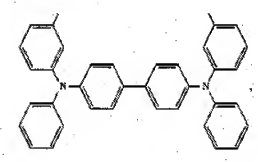
40. Concerning claims 31-32, Funhoff et al. and Lamansky et al. and D'Andrade et al. describe the electroluminescent device discussed above, comprising multiple light emitting layers, each of which emits a separate color, to form a multicolor organic light emitting device which emits white light. Funhoff et al. are silent on a method of forming a multicolor device.

41. Okunaka et al. describe the method for forming a film of an electroluminescent device comprising the steps of forming the film, exposing the film to actinic radiation (UV light) through a mask, and developing the layer by treatment with solvent to remove unexposed material, as discussed above.

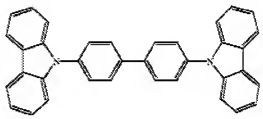
42. It would have been obvious to one of ordinary skill to repeat the process described by Okunaka et al. multiple times for the purpose of layering one layer on top of another to form the multilayer device described by Funhoff et al. and Lamansky et al., in conjunction with D'Andrade et al., since the method would be predicted to be successful.

43. Claims 6-8 rejected under 35 U.S.C. 103(a) as being unpatentable over Funhoff et al. (5,518,824) in view of Lamansky et al. (Organic Electronics, vol. 2, no. 1, pp. 53-62, 2001) as applied to claims 1-5 above, and further in view of Thompson et al. (6,150,043) and Nakaya (JP 2000-256319).

44. Concerning claims 6-8, Funhoff et al. describes the composition discussed above, where the charge transporting molecule is modified by one or more groups capable of anionic, cationic, or free-radical polymerization, preferably the use of more than one, since network formation takes place more readily (column 6, lines 44-51). Funhoff et al. discloses suitable charge transport molecules such as the molecule shown below, and gives examples of polymerizable substituents as shown above. Funhoff et al. are silent on compounds containing polymerizable side chains where the structure is a dimer of triphenylamine as shown below, or where the two aromatic rings have been linked to form a carbazole group.



45. Thompson et al. describe charge transport materials for organic electroluminescent devices, including the compound shown below, as being known as hole transporting materials. (column 4) Methods for modifying carbazole substituents with polymerizable substituents are described by Nakaya et al. (column 3 and 4)



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46. Given the teaching by Funhoff et al. that hole transport materials with substituents capable of polymerization are preferable, it would have been obvious to one of ordinary skill in the art to modify the compound shown below with polymerizable substituents, for use in the electroluminescent device described by Funhoff et al.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael E. Nelson whose telephone number is 571-270-3453. The examiner can normally be reached on M-F 7:30am-5:00pm EST (First Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, D. Lawrence Tarazano can be reached on 571-272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/
Supervisory Patent Examiner, Art Unit 4174

Michael E. Nelson
Examiner
Art Unit 4174